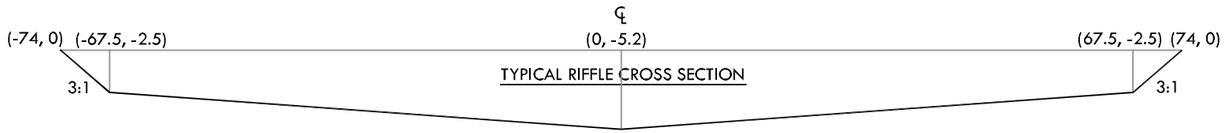
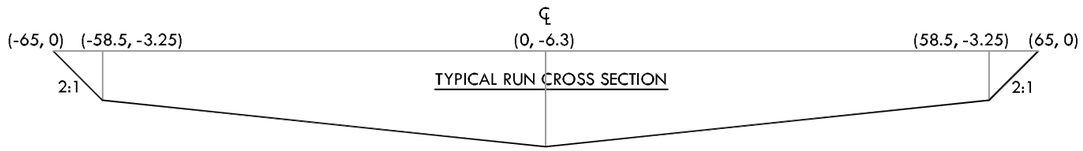
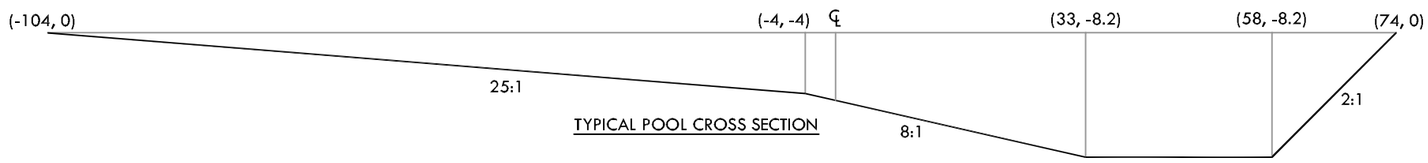
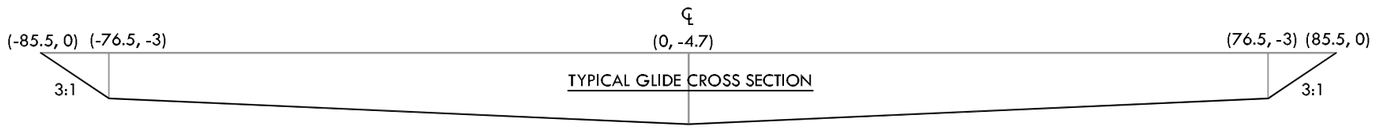
CFR3





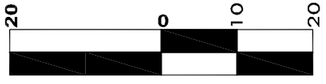




BANKFULL CHANNEL DESIGN DIMENSIONS
CFR3

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	3200 cfs	3200 cfs	3200 cfs	3200 cfs
WIDTH	163-193 ft	141-156 ft	120-142 ft	162-179 ft
MEAN DEPTH	2.9-3.4 ft	3.5-3.9 ft	4.1-4.8 ft	3.5-3.9 ft
MAX. DEPTH	7.4-11.1 ft	4.7-5.7 ft	5.9-6.7 ft	4.2-5.1 ft
SCOUR DEPTH	13 ft	5.9 ft	7.4 ft	5.3 ft
XS AREA	688 sq ft	550 sq ft	578 sq ft	605 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	42-51

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull



SCALE: 1" = 20' H
SCALE: 1" = 10' V

Seal

NO.	DATE	BY	REVISION DESCRIPTION
2	10-15-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW	**SHEET K-1**	
DESIGNED BY:	GTD/MSD		
CHECKED BY:	MSD	FILE NAME: RDG-11X17.dwg	
PROJECT NO.:	RDG-04-018		

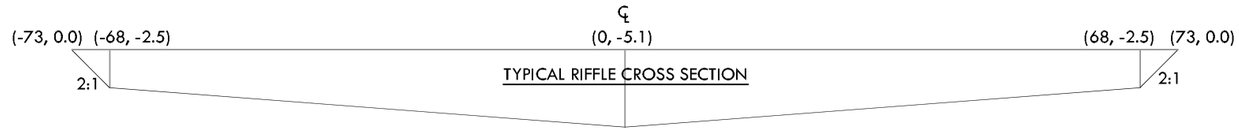
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

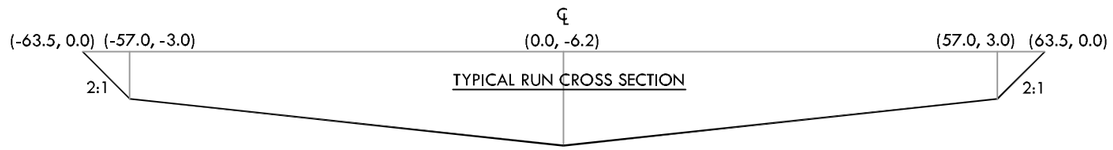
WestWater Consultants, Inc.

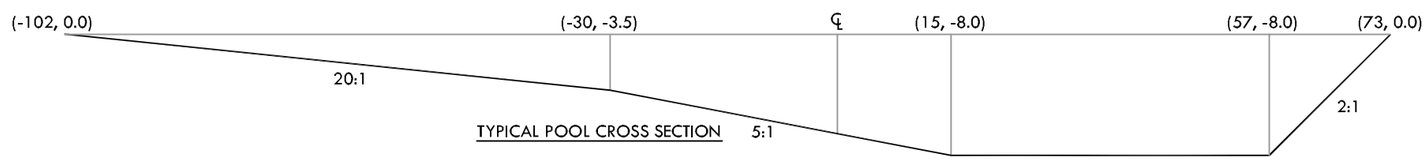
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

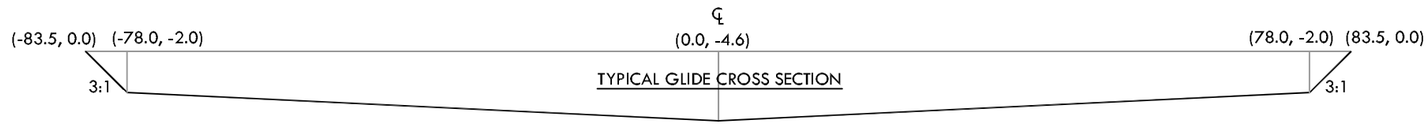
RIVER DESIGN GROUP, INC.

CFR 2









BANKFULL CHANNEL DESIGN DIMENSIONS
CFR 2

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	3200 cfs	3200 cfs	3200 cfs	3200 cfs
WIDTH	160-189 ft	138-153 ft	118-139 ft	159-176 ft
MEAN DEPTH	2.8-3.3 ft	3.5-3.8 ft	4.0-4.7 ft	3.5-3.8 ft
MAX. DEPTH	7.3-10.9 ft	4.6-5.6 ft	5.8-6.6 ft	4.1-5.0 ft
SCOUR DEPTH	12.7 ft	5.8 ft	7.3 ft	5.2 ft
XS AREA	795 sq ft	530 sq ft	557 sq ft	583 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	42-50

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull

Seal

20 0 10 20

SCALE: 1" = 20' H
SCALE: 1" = 10' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-2

FILE NAME: RDG-11X17.dwg

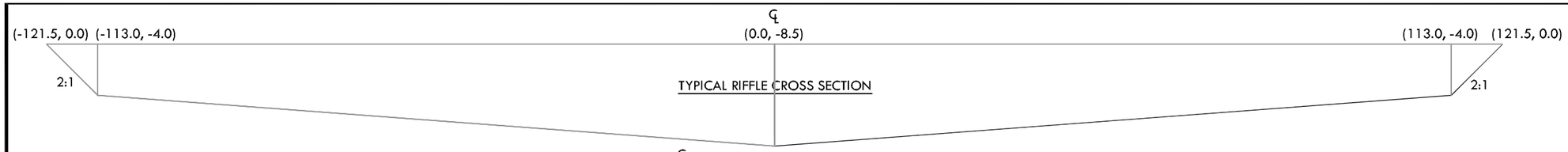
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

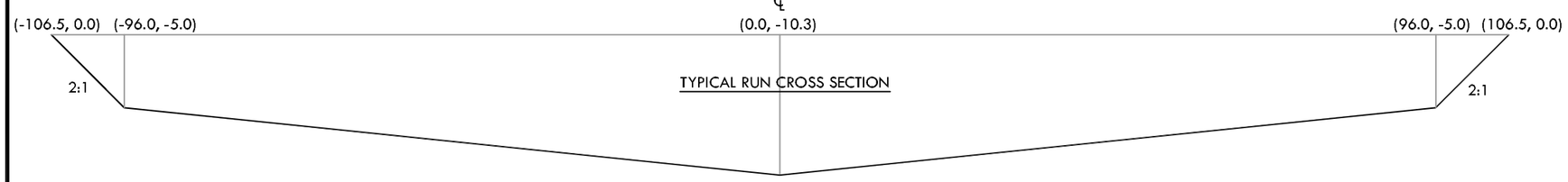
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

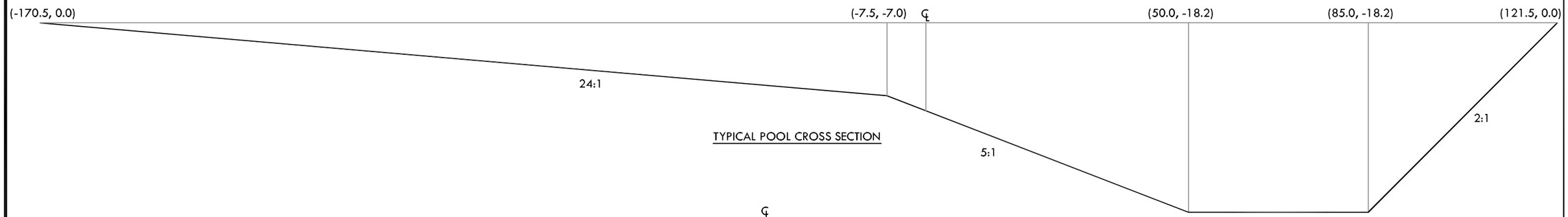
CFR 1



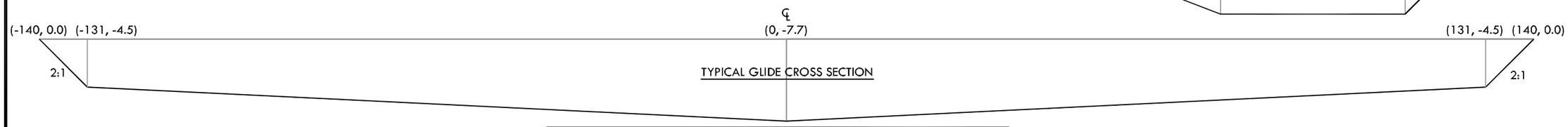
TYPICAL RIFFLE CROSS SECTION



TYPICAL RUN CROSS SECTION



TYPICAL POOL CROSS SECTION



TYPICAL GLIDE CROSS SECTION

BANKFULL CHANNEL DESIGN DIMENSIONS
CFR 1

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	10400 cfs	10400 cfs	10400 cfs	10400 cfs
WIDTH	268-316 ft	231-255 ft	197-232 ft	265-293 ft
MEAN DEPTH	4.7-5.5 ft	5.8-6.4 ft	6.7-7.9 ft	5.8-6.4 ft
MAX. DEPTH	12.2-24.3 ft	8.3-8.7 ft	9.7-10.9 ft	7.5-7.8 ft
SCOUR DEPTH	24.3 ft	9.1 ft	12.2 ft	8.2 ft
XS AREA	2220 sq ft	1480 sq ft	1554 sq ft	1628 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	41-51

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull

20 0 10 20

SCALE: 1" = 20' H
SCALE: 1" = 10' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

Seal

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-3

FILE NAME: RDG-11X17.dwg

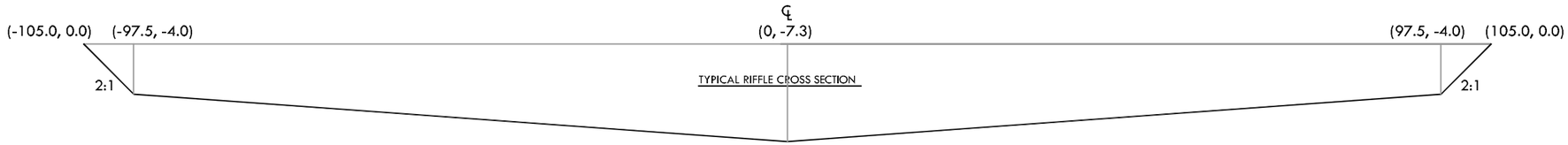
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

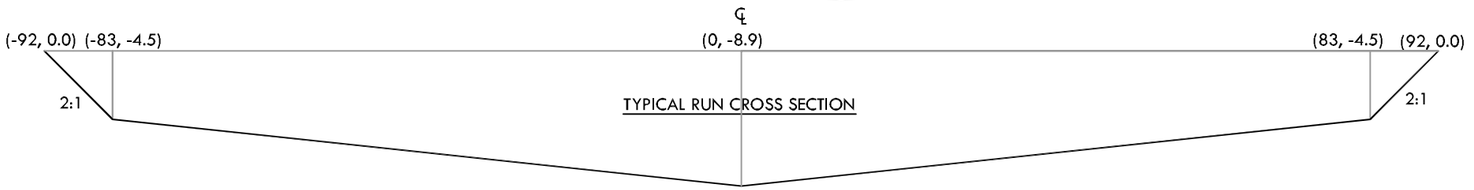
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

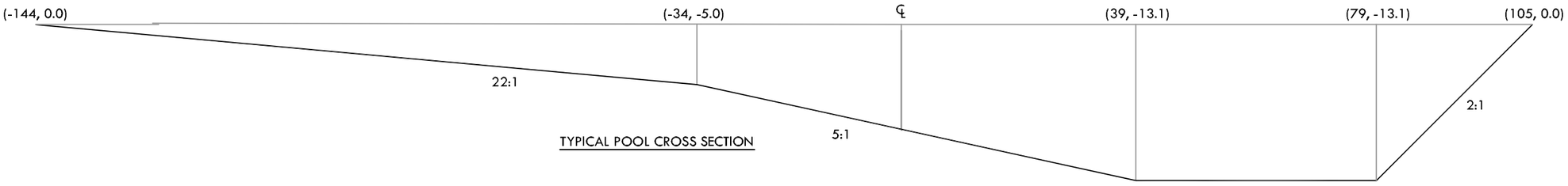
CFR 1 - Right Channel @ Island Below Dam



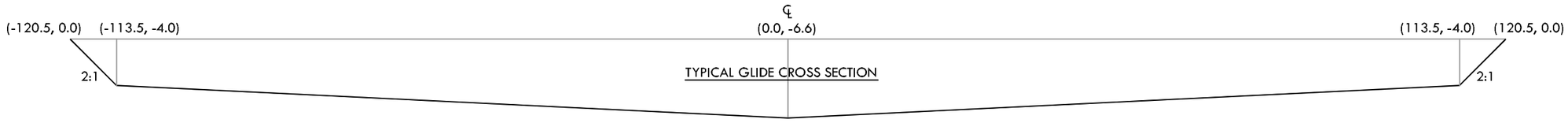
TYPICAL RIFFLE CROSS SECTION



TYPICAL RUN CROSS SECTION



TYPICAL POOL CROSS SECTION



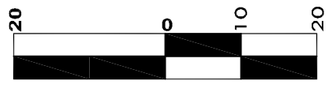
TYPICAL GLIDE CROSS SECTION

BANKFULL CHANNEL DESIGN DIMENSIONS
CFR 1 Right Channel @ Island Below Dam

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	10400 cfs	10400 cfs	10400 cfs	10400 cfs
WIDTH	231-273 ft	199-220 ft	169-200 ft	229-253 ft
MEAN DEPTH	4.0-4.8 ft	5.0-5.5 ft	5.8-6.8 ft	5.0-5.5 ft
MAX. DEPTH	10.5-15.7 ft	7.2-7.5 ft	8.4-9.4 ft	6.5-6.8 ft
SCOUR DEPTH	18.4 ft	7.9 ft	10.5 ft	7.1 ft
XS AREA	1650 sq ft	1100 sq ft	1155 sq ft	1210 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	42-51

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull

Seal



SCALE: 1" = 20' H
SCALE: 1" = 10' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-4

FILE NAME: RDG-11X17.dwg

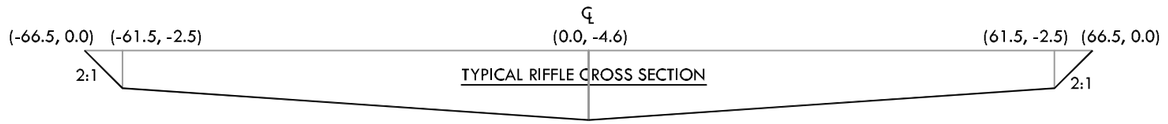
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

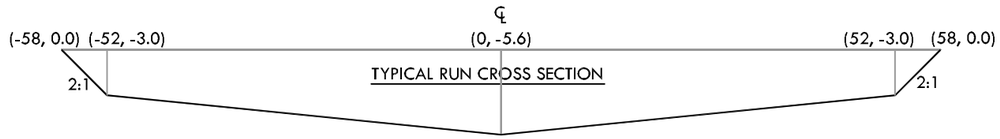
WestWater Consultants, Inc.

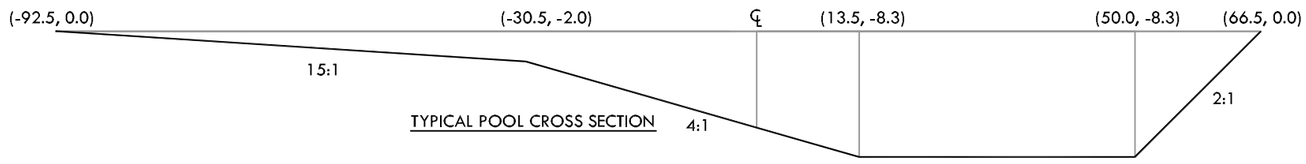
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

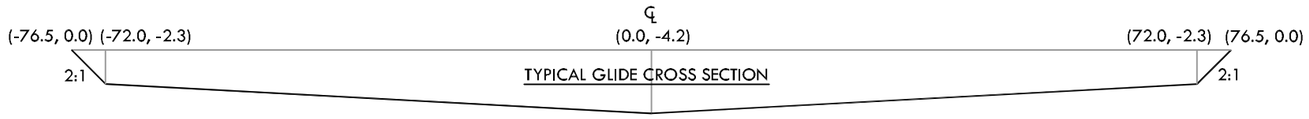
RIVER DESIGN GROUP, INC.

CFR 1 - Left Channel @ Island Below Dam









BANKFULL CHANNEL DESIGN DIMENSIONS
CFR 1 - Left Channel @ Island Below Dam

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	10400 cfs	10400 cfs	10400 cfs	10400 cfs
WIDTH	146-172 ft	126-139 ft	107-127 ft	145-160 ft
MEAN DEPTH	2.6-3.0 ft	3.2-3.5 ft	3.6-4.3 ft	3.2-3.5 ft
MAX. DEPTH	6.6-9.9 ft	4.5-4.7 ft	5.3-6.0 ft	4.1-4.3 ft
SCOUR DEPTH	11.6 ft	5.0 ft	6.6 ft	4.5 ft
XS AREA	660 sq ft	440 sq ft	462 sq ft	484 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	41-50

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull

20 0 10 20

SCALE: 1" = 20' H
SCALE: 1" = 10' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-5

FILE NAME: RDG-11X17.dwg

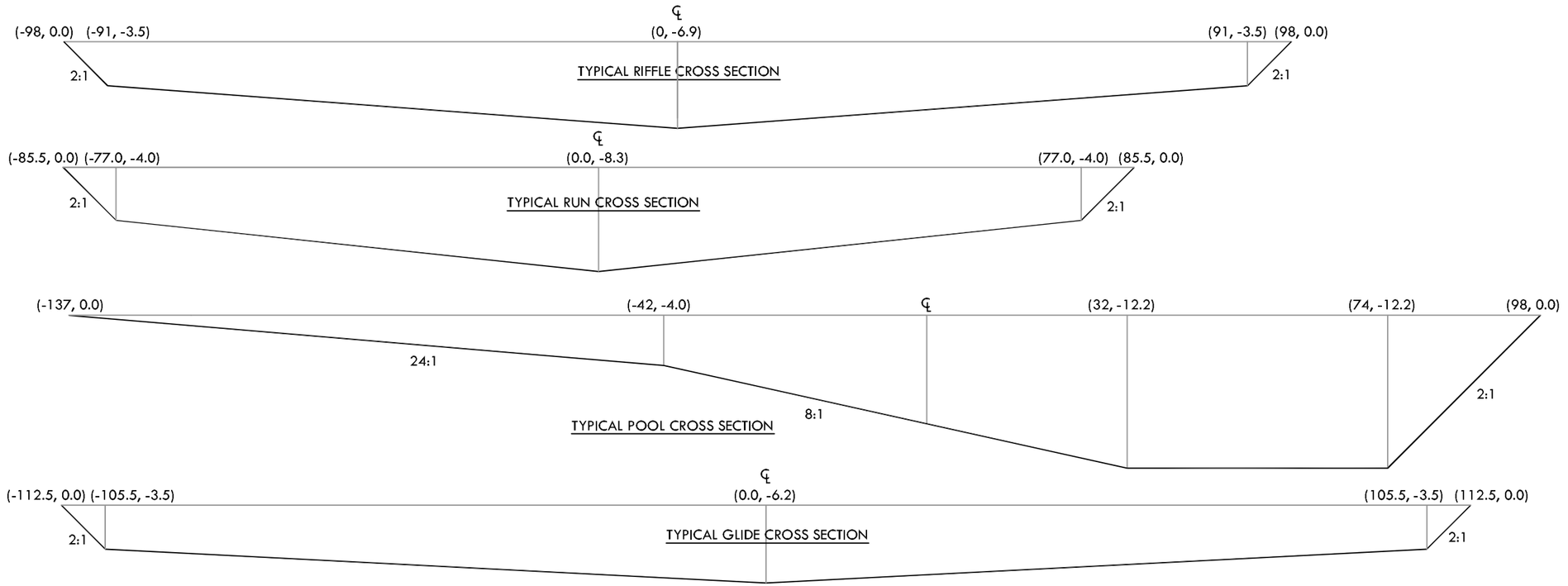
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

BFR 1



BANKFULL CHANNEL DESIGN DIMENSIONS
BFR 1

PARAMETER / FEATURE	POOL	RIFFLE	RUN	GLIDE
DISCHARGE	6200 cfs	6200 cfs	6200 cfs	6200 cfs
WIDTH	216-255 ft	186-206 ft	158-187 ft	214-236 ft
MEAN DEPTH	3.8-4.5 ft	4.7-5.2 ft	5.4-6.4 ft	4.7-5.2 ft
MAX. DEPTH	9.8-14.7 ft	6.2-7.5 ft	7.8-8.8 ft	5.6-6.7 ft
SCOUR DEPTH	17.1 ft	7.8 ft	9.8 ft	7.1 ft
XS AREA	1440 sq ft	960 sq ft	1008 sq ft	1056 sq ft
WIDTH:DEPTH	N/A	36-44	25-35	41-50

(x, y)
x - horizontal distance from channel alignment centerline
y - vertical difference in elevation from bankfull

20 0 10 20

SCALE: 1" = 20' H
SCALE: 1" = 10' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

Seal

TYPICAL CHANNEL CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-6

FILE NAME: RDG-11X17.dwg

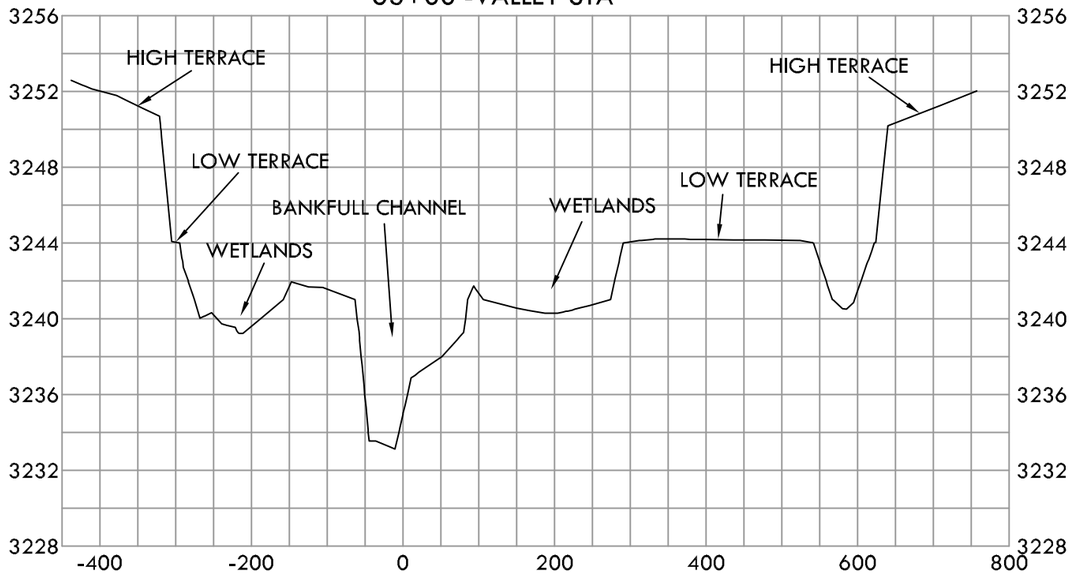
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

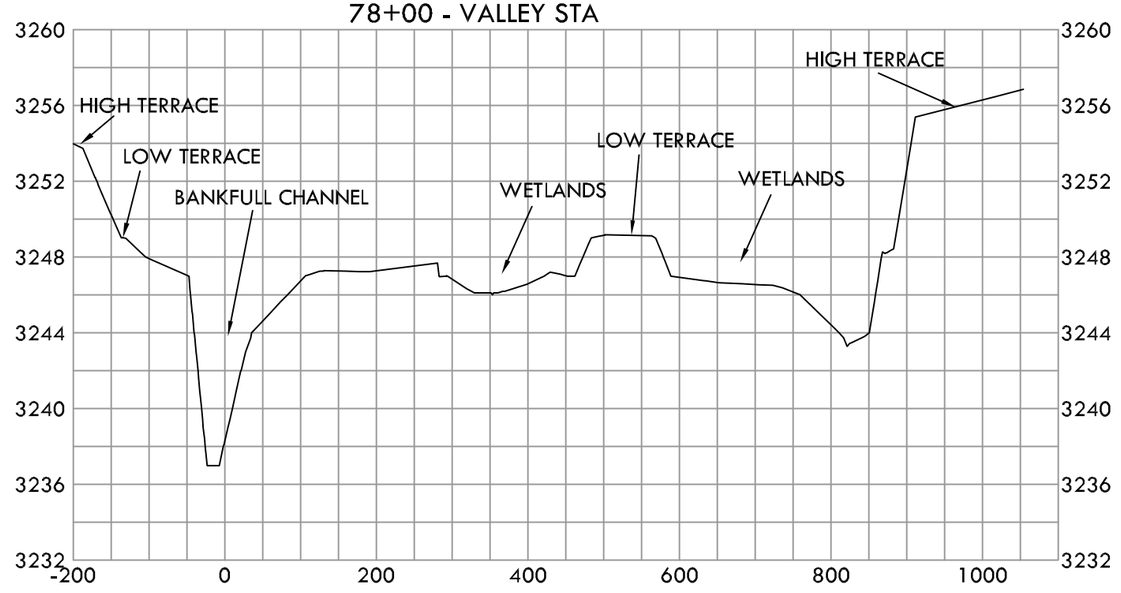
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

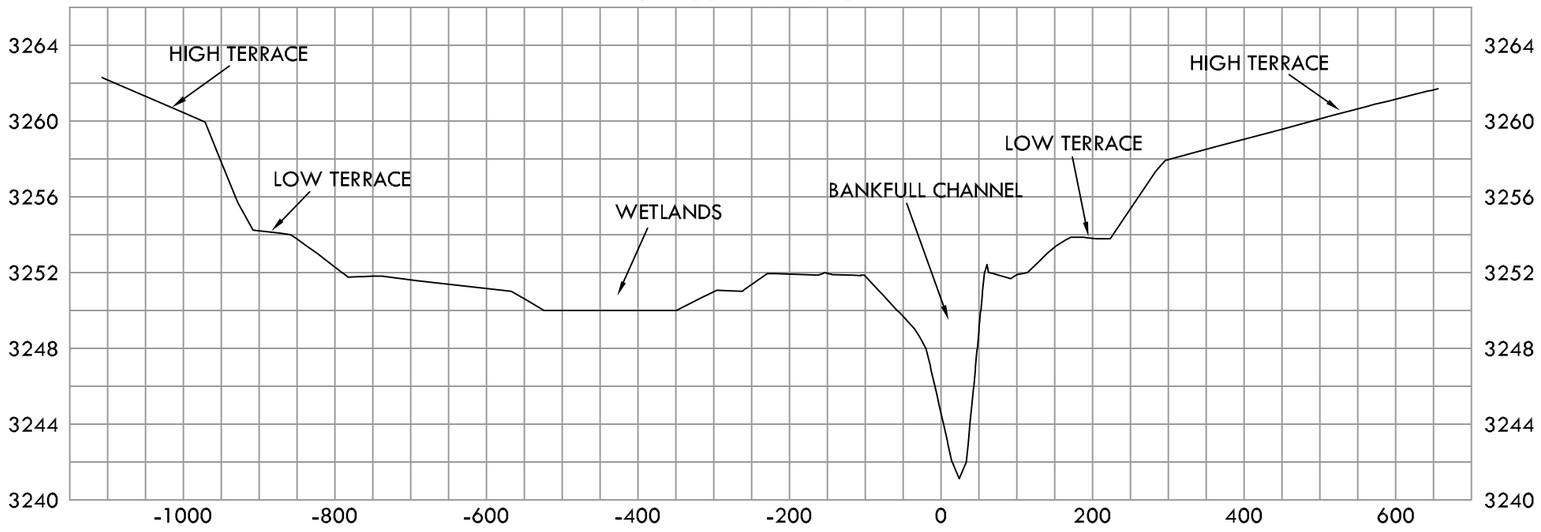
63+00 -VALLEY STA



78+00 - VALLEY STA



91+00 - VALLEY STA



EXISTING GROUND

PROPOSED GROUND

* VIEWING UPSTREAM *

* REFER TO SHEET J-2 FOR PLAN VIEW *

200 0 100 200

SCALE: 1" = 200' H
SCALE: 1" = 8' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

Seal

CFR 2 - VALLEY CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW	SHEET K-7	
DESIGNED BY:	GTD/MSD		
CHECKED BY:	MSD	FILE NAME: RDG-11X17.dwg	
PROJECT NO.:	RDG-04-018		

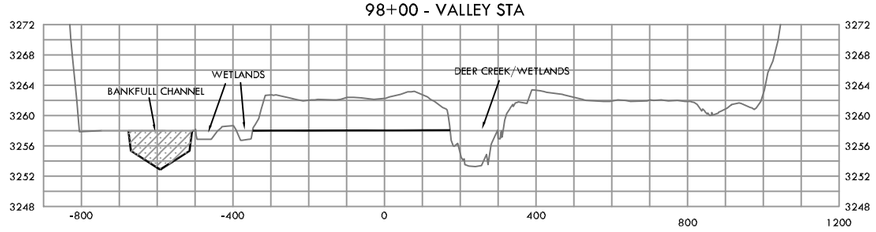
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

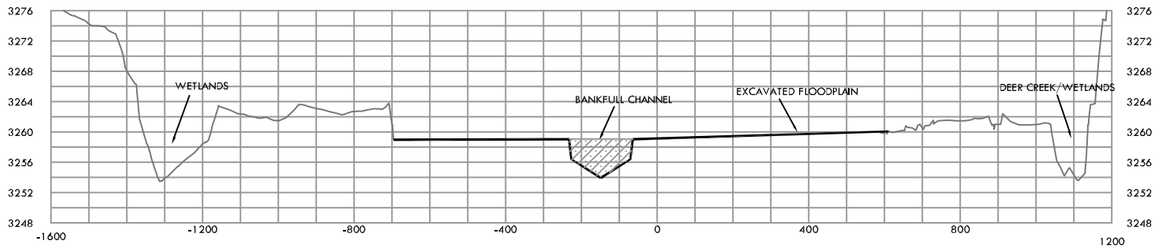
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

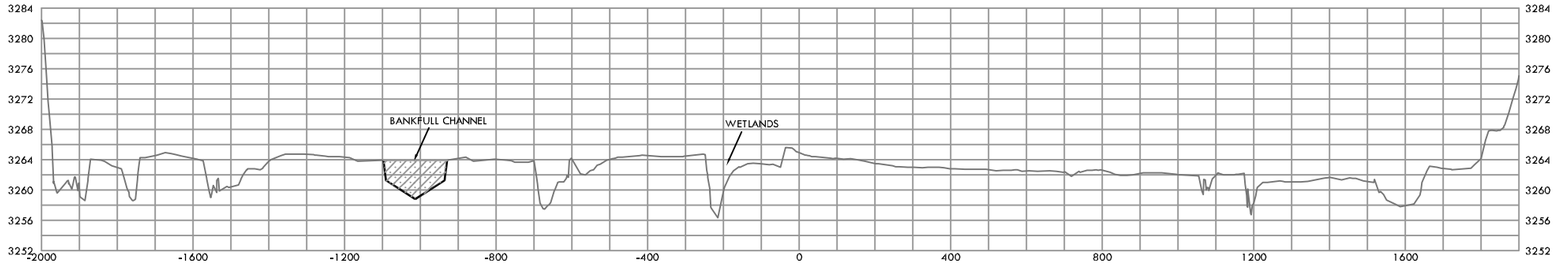
98+00 - VALLEY STA



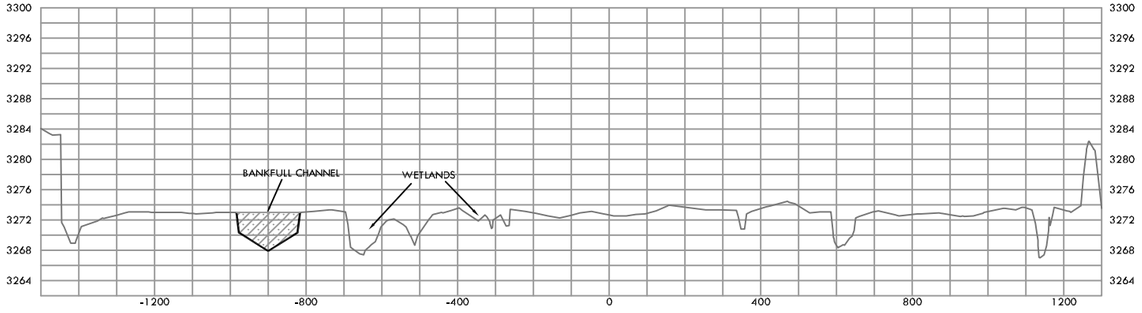
105+00 - VALLEY STA



120+00 - VALLEY STA



150+00 - VALLEY STA



EXISTING GROUND

PROPOSED GROUND

* VIEWING UPSTREAM *

* REFER TO SHEET J-2 & J-3 FOR PLAN VIEW *

400 0 200 400

SCALE: 1" = 400' H
SCALE: 1" = 20' V

Seal

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

CFR 3 - VALLEY CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-8

FILE NAME: RDG-11X17.dwg

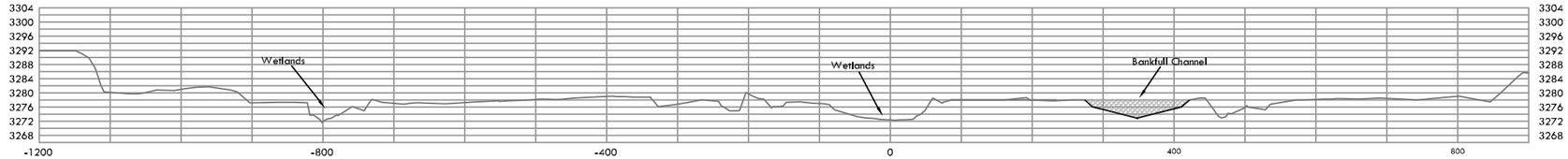
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

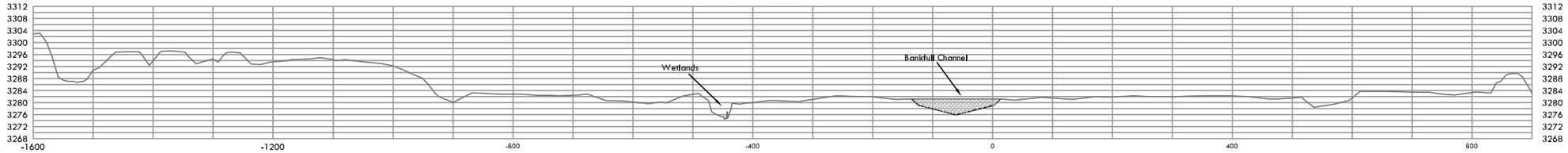
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

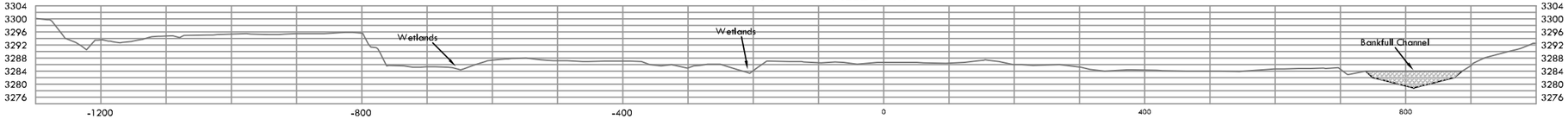
165+00 - VALLEY STA



175+00 - VALLEY STA



185+00 - VALLEY STA



EXISTING GROUND

PROPOSED GROUND

* VIEWING UPSTREAM *

* REFER TO SHEET J-3 FOR PLAN VIEW *

200 0 100 200

SCALE: 1" = 200' H
SCALE: 1" = 40' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

Seal

CFR 3 - VALLEY CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW	**SHEET K-9**	
DESIGNED BY:	GTD/MSD		
CHECKED BY:	MSD	FILE NAME: RDG-11X17.dwg	
PROJECT NO.:	RDG-04-018		

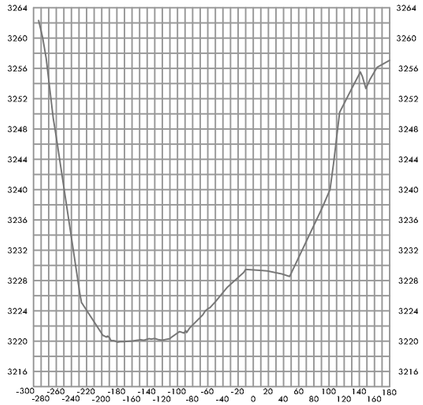
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

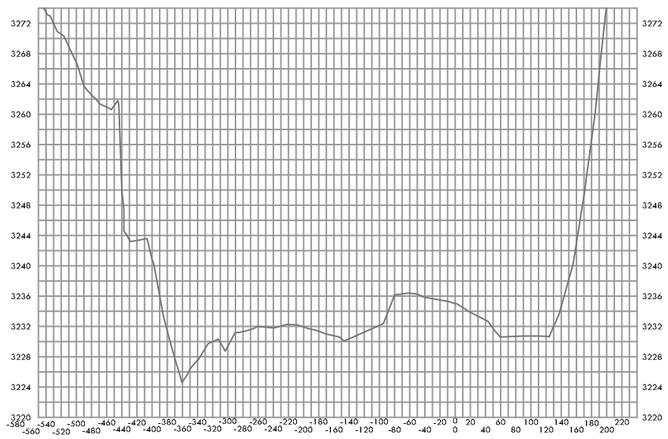
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

27+00 - VALLEY STA



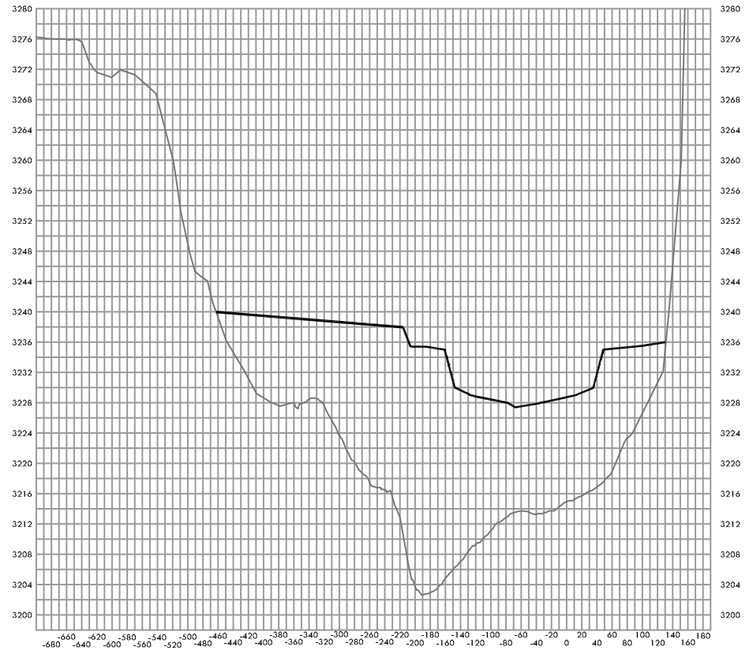
41+00 - VALLEY STA



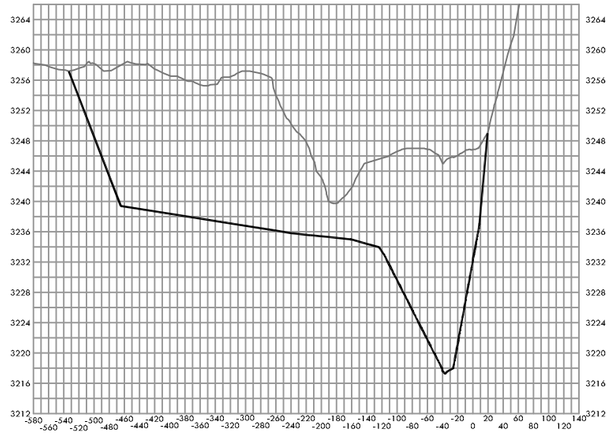
EXISTING GROUND
PROPOSED GROUND

* VIEWING UPSTREAM *
* REFER TO SHEET J-1 FOR PLAN VIEW*

45+00 - VALLEY STA



50+00 - VALLEY STA



200 0 100 200

SCALE: 1" = 200' H
SCALE: 1" = 20' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

Seal

CFR 1 - VALLEY CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW	**SHEET K-10**	
DESIGNED BY:	GTD/MSD		
CHECKED BY:	MSD	FILE NAME: RDG-11X17.dwg	
PROJECT NO.:	RDG-04-018		

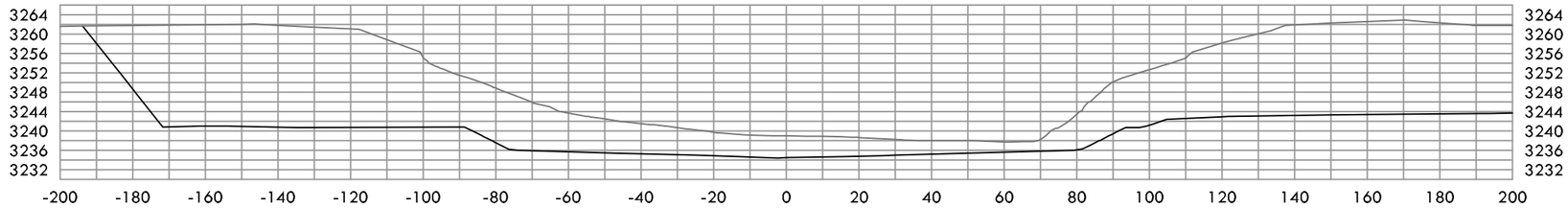
WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

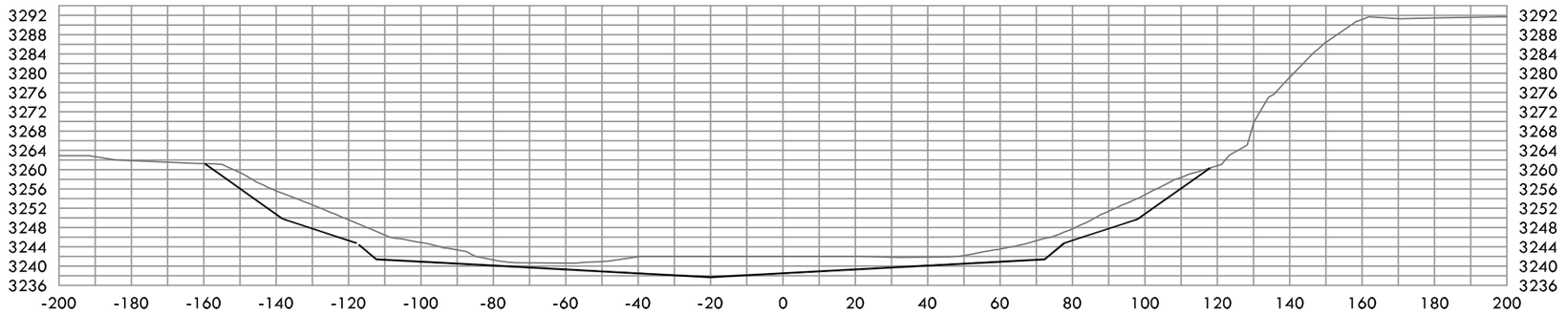
River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.

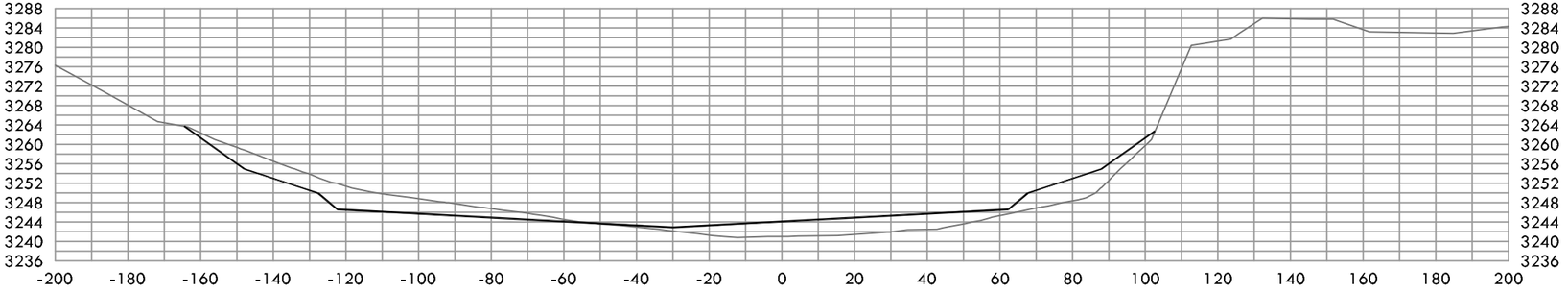
7+00 - BFR STA



20+00 - BFR STA



40+00 - BFR STA



EXISTING GROUND

PROPOSED GROUND

* VIEWING UPSTREAM *

* REFER TO SHEET I-5 FOR PLAN VIEW *

Seal

40 0 20 40

SCALE: 1" = 40' H
SCALE: 1" = 30' V

NO.	DATE	BY	REVISION DESCRIPTION
2	10-14-05	KLC	FINAL
1	03-29-05	MSD	DRAFT

BFR 1 - VALLEY CROSS SECTIONS

RESTORATION PLAN

DRAWN BY:	NMW
DESIGNED BY:	GTD/MSD
CHECKED BY:	MSD
PROJECT NO.:	RDG-04-018

SHEET K-11

FILE NAME: RDG-11X17.dwg

WestWater Consultants, Inc.
1112 Catherine Lane
Corvallis, MT 59828
tel: (406) 961-3348

WestWater Consultants, Inc.

River Design Group, Inc.
P.O. Box 1722
Whitefish, MT 59937
tel: (406) 862-4927
fax: (406) 862-4963
www.riverdesigngroup.net

RIVER DESIGN GROUP, INC.